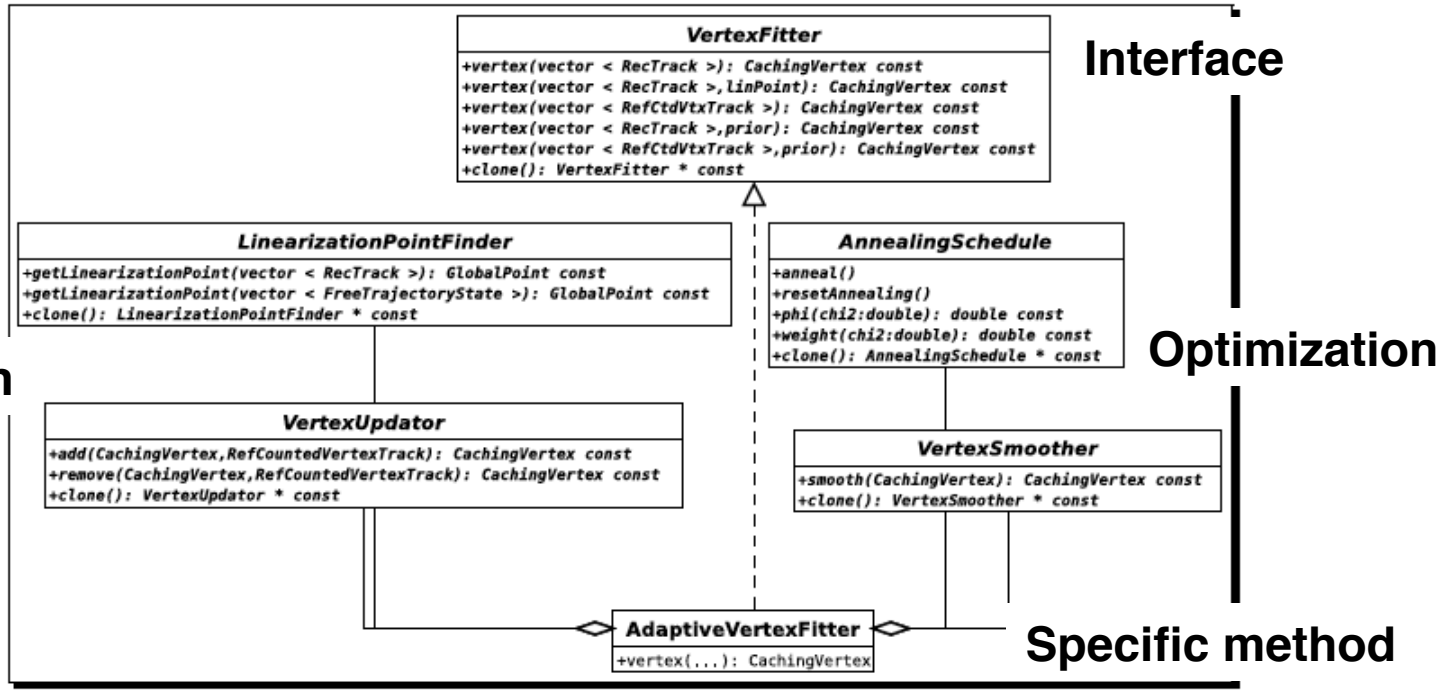
RAVE – Vertex Finder

Sanghoon Lim

- Rave
  - Reconstruction in an Abstract, Versatile Environment
  - vertex reconstruction toolkit with input of reconstructed track
  - developed for CMS

- GFRave
  - Interface between Genfit and Rave
  - Reconstructed tracks from Genfit can be used directly

Example flow

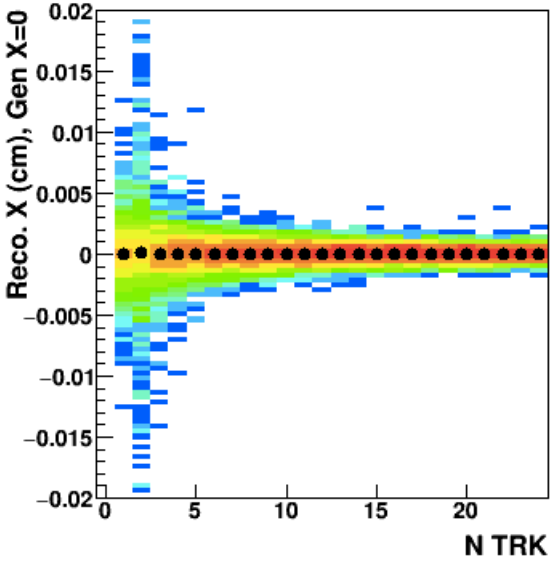


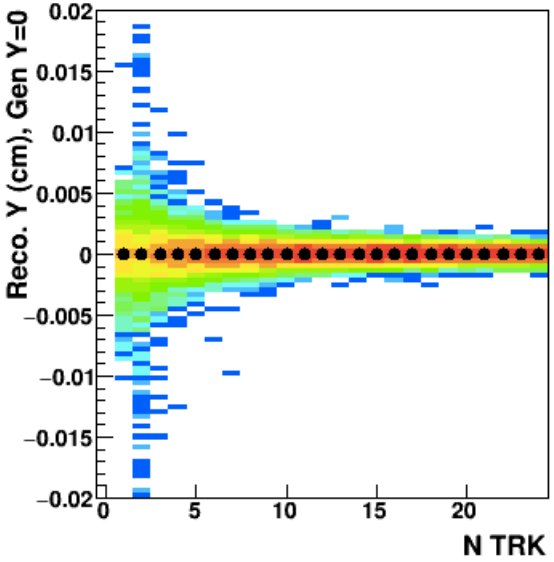
Vertex Finding methods

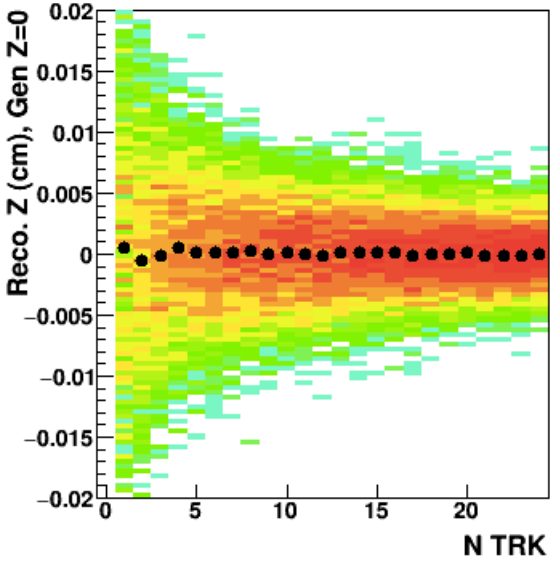
- Handling tracks
  - **Linear Vertex Fitter**: simple line
  - **Kalman Vertex Fitter**: parameters from Kalman filter

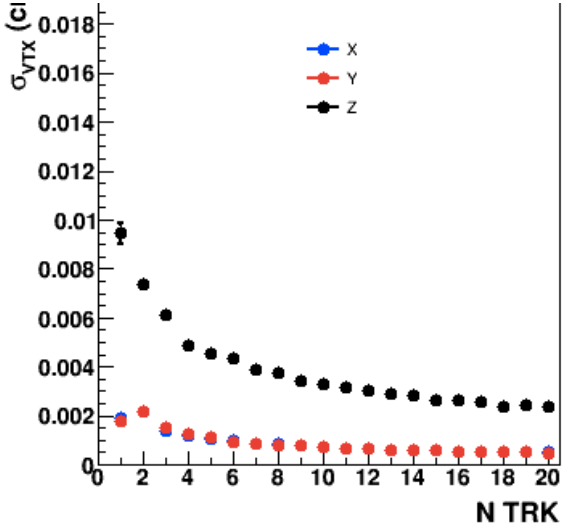
- Handling outlying tracks
  - **Trimming Vertex Fitter**
    simply reject outlying tracks
  - **Adaptive Vertex Fitter**
    use a weight function to de-weight outlying tracks

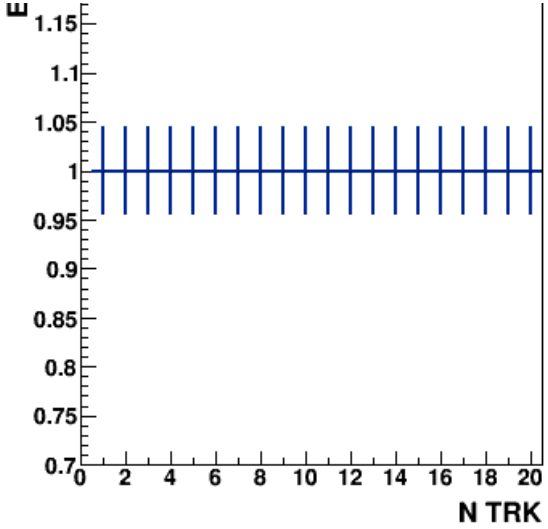
- Multiple vertex finding
  - **Multi Vertex Fitter**
    very similar to AdpativeVertexFitter but able to reconstruct multiple vertices





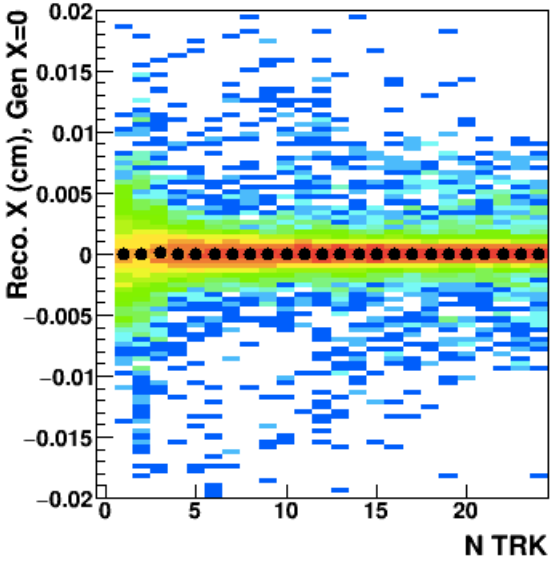


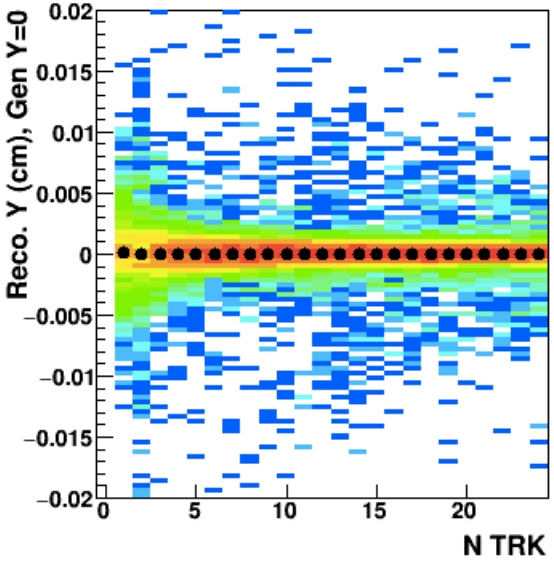


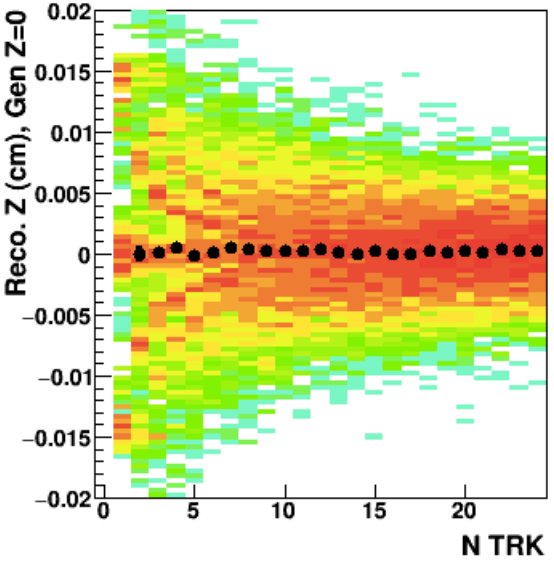


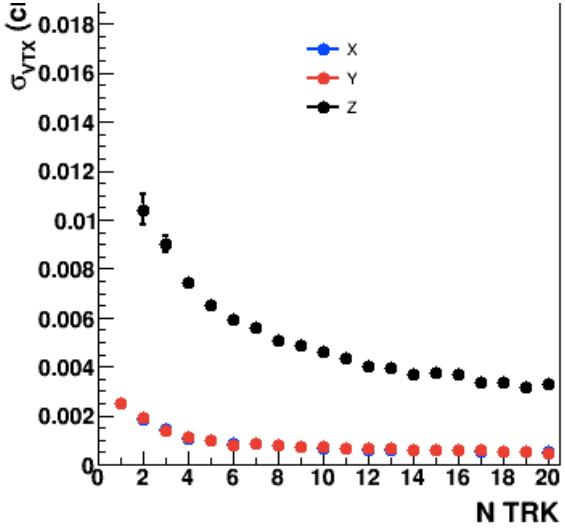
- random generation of muon at (0,0,0)
  - $1<p_T<40$ GeV/c (flat), -0.5<eta<0.5 (flat)

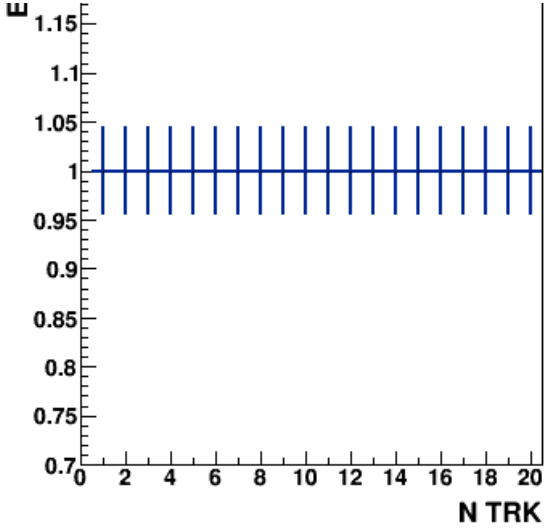
PIXEL + STRIP











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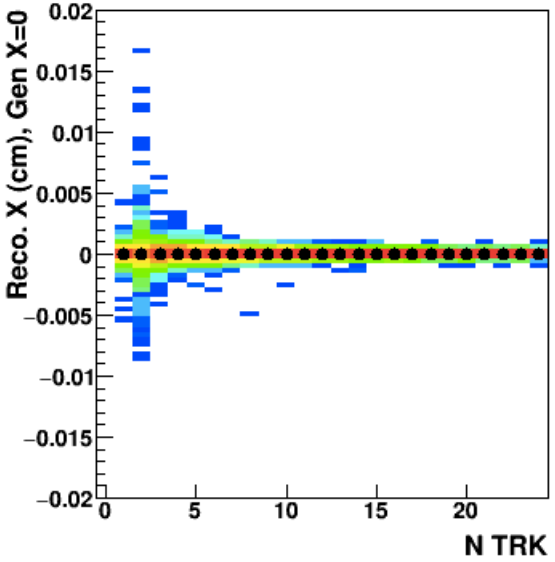

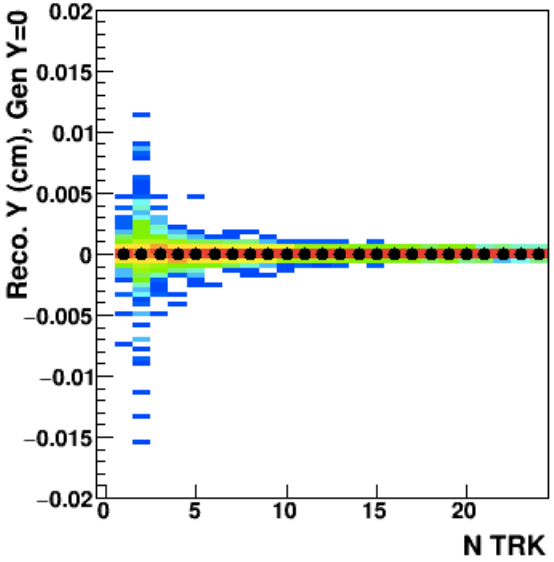

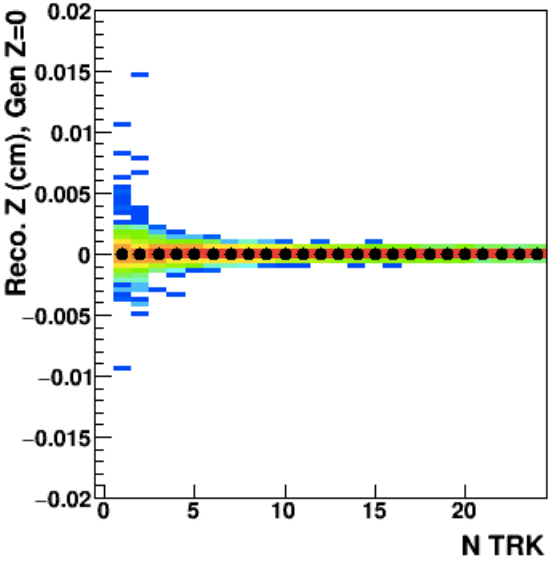

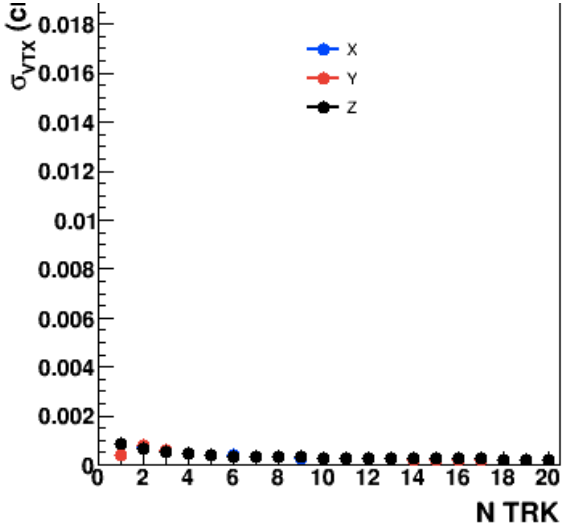

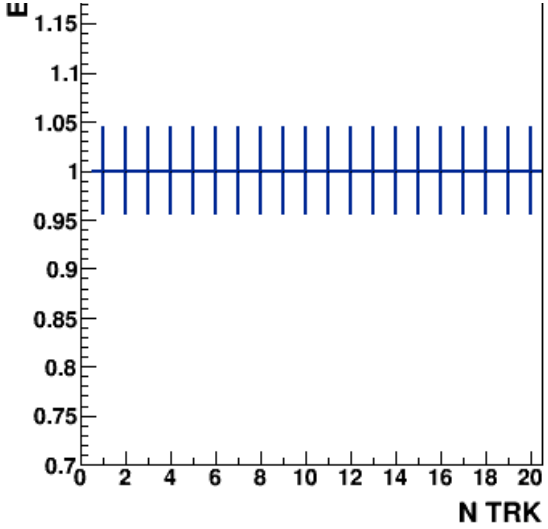

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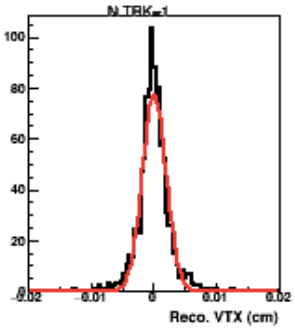
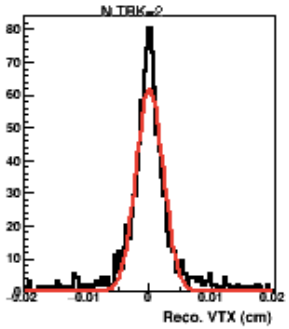
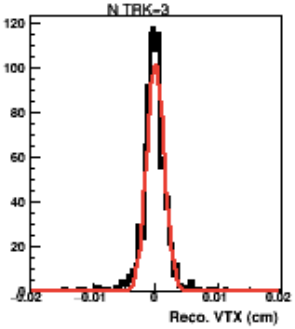
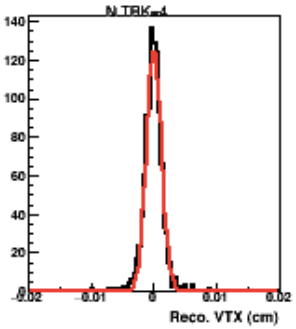
Comparison of x_{VTX} (N_{track} 1-5)

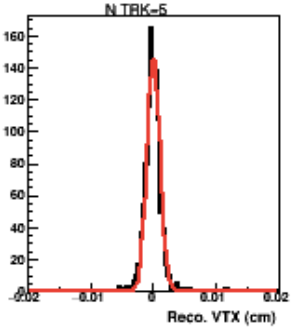
MIE



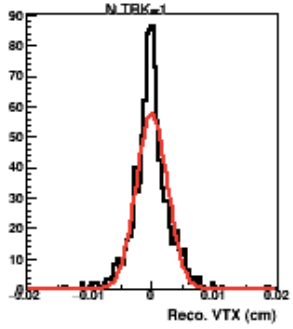


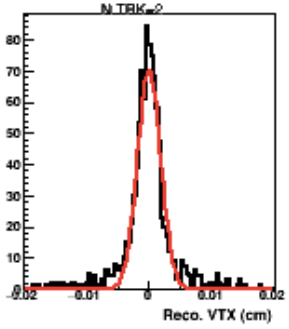


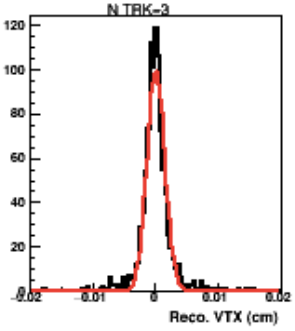


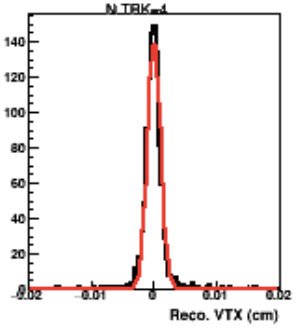


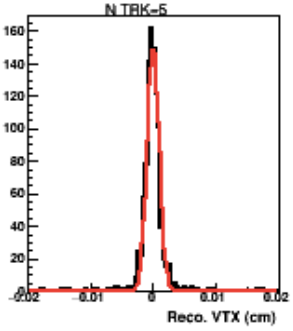
PIXEL+STRIP











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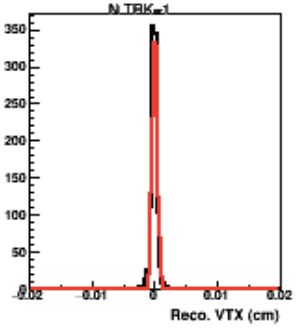
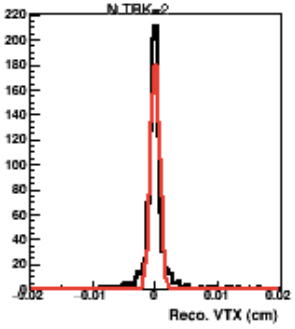
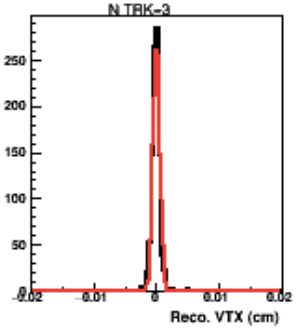
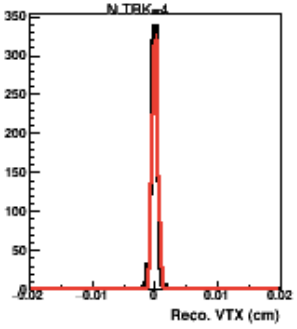
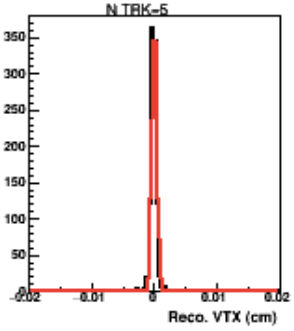




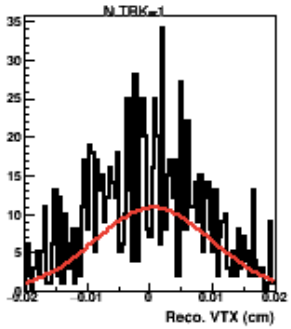


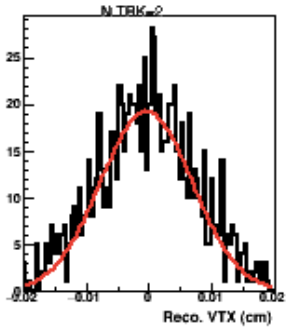


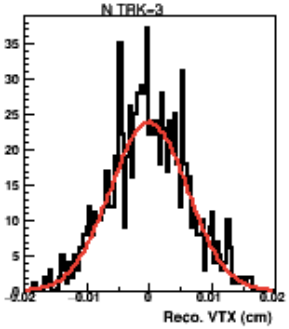


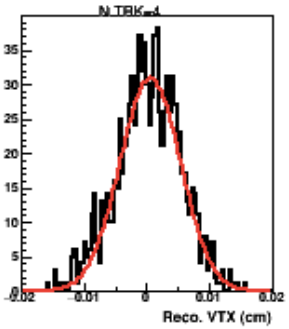
Comparison of z_{VTX} (N_{track} 1-5)

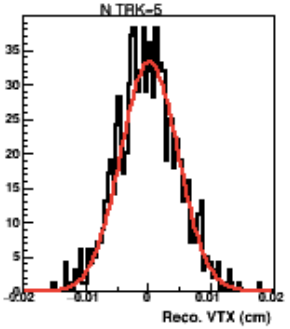
MIE



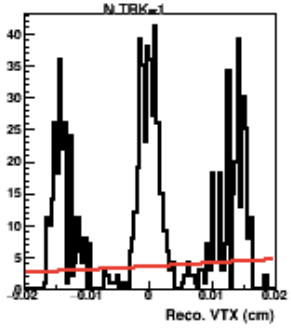


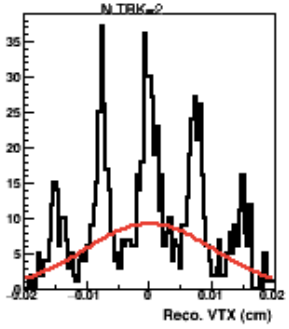


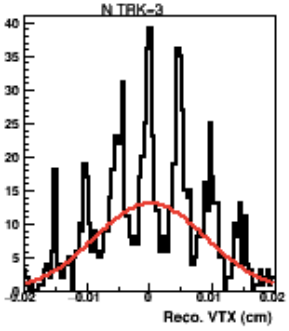


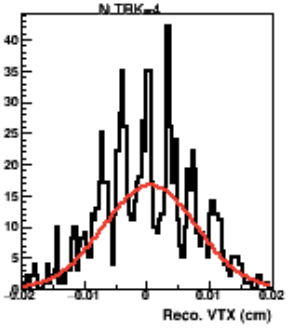


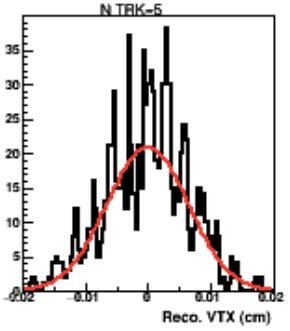
PIXEL+STRIP strange structure!











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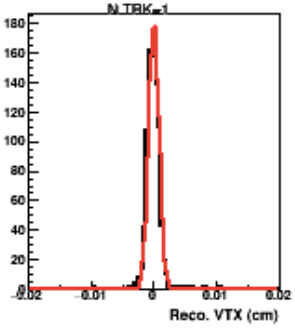
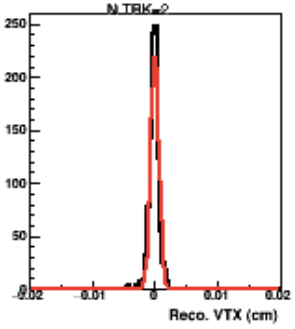
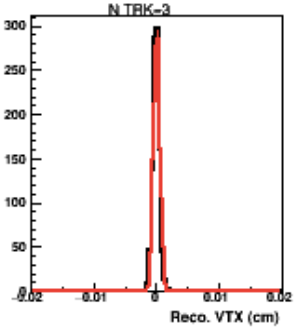
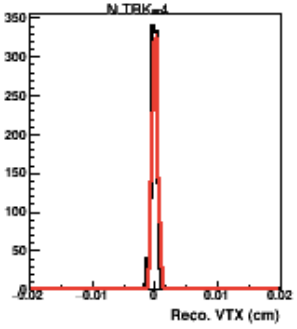
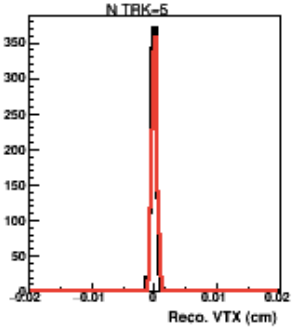


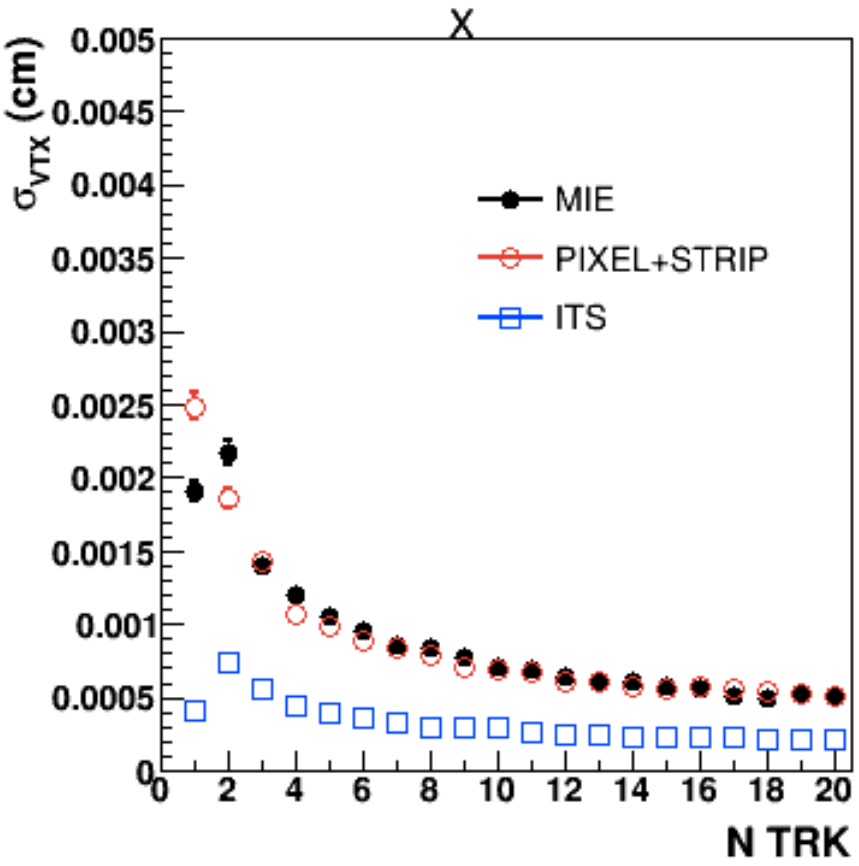


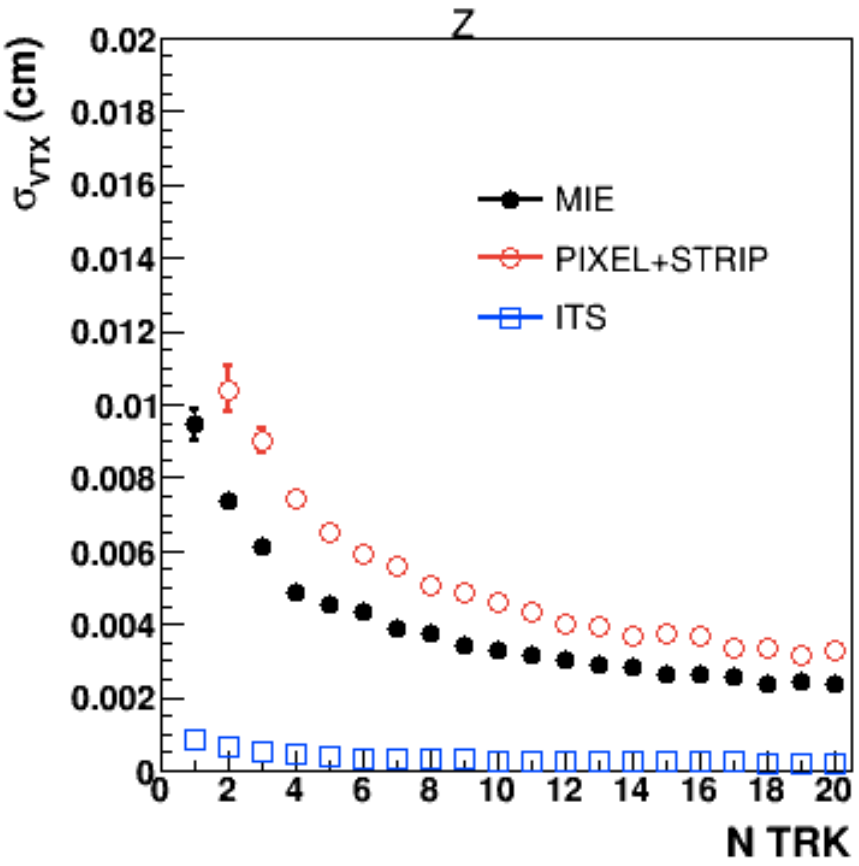






Vertex resolution of 3 configurations

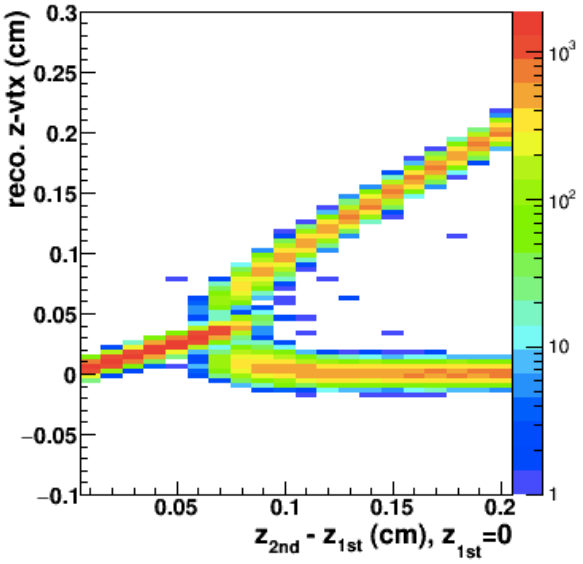




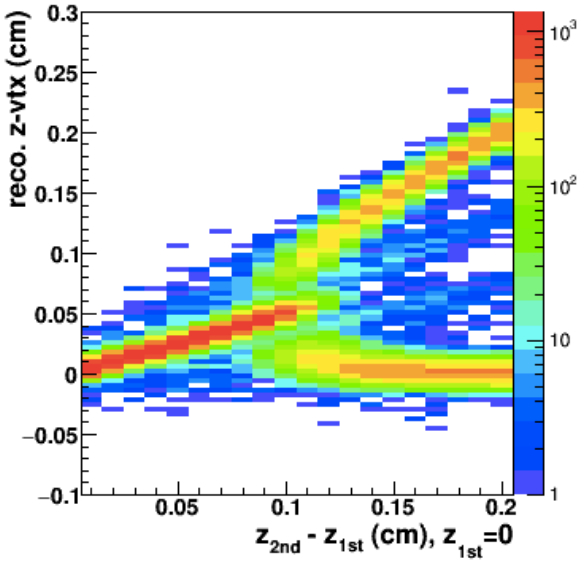
Multiple vertex reconstruction

- generate **5 tracks** at each z position of z=0 and z=z_{2nd} cm
- scan z_{2nd} from 0.01 cm to 0.20 cm with 0.01 cm interval (2k try for each z_{2nd})

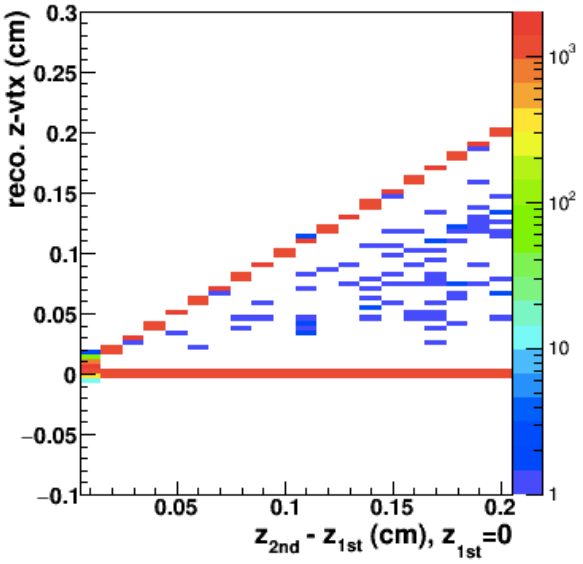
MIE



PIXEL+STRIP



ITS



Multiple vertex reconstruction

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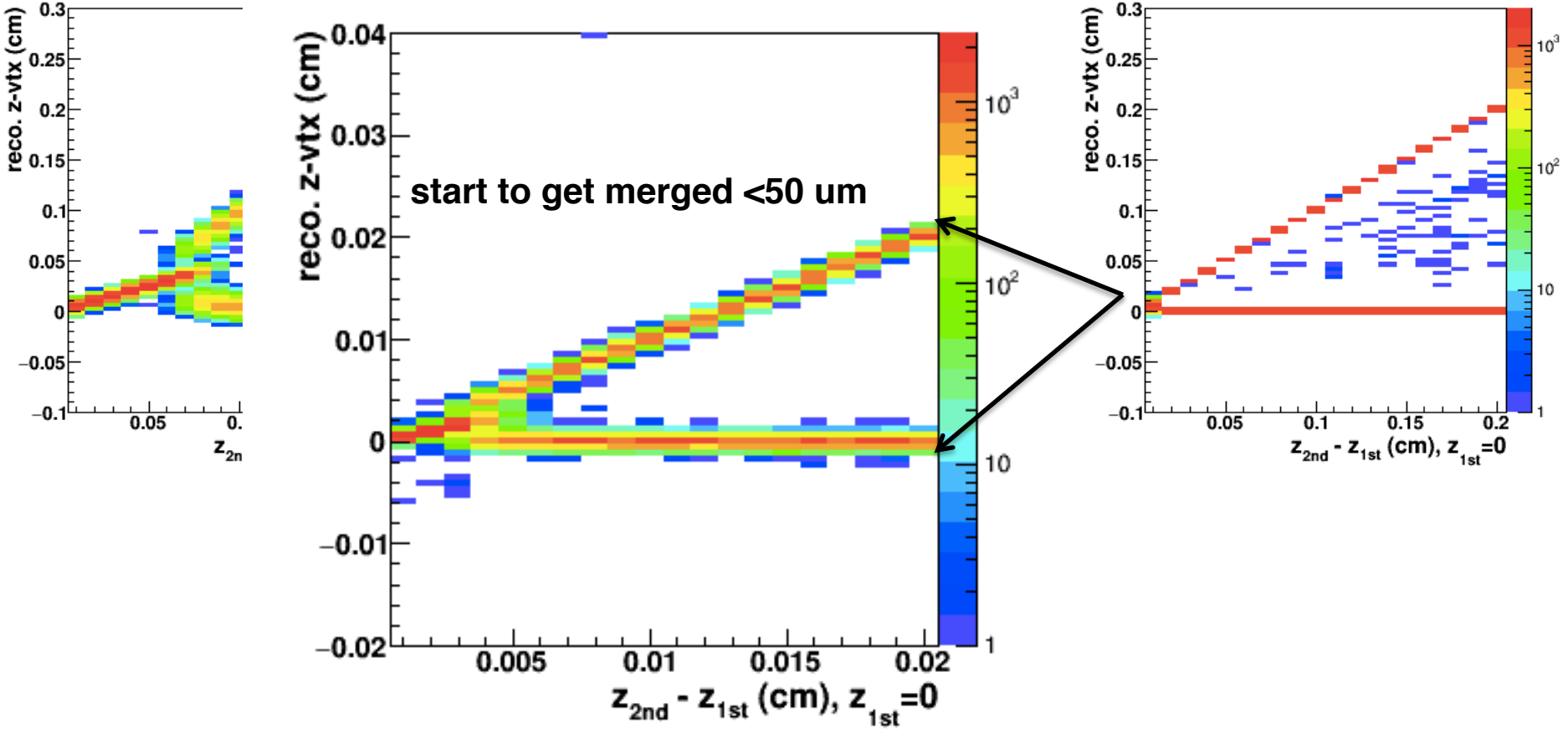
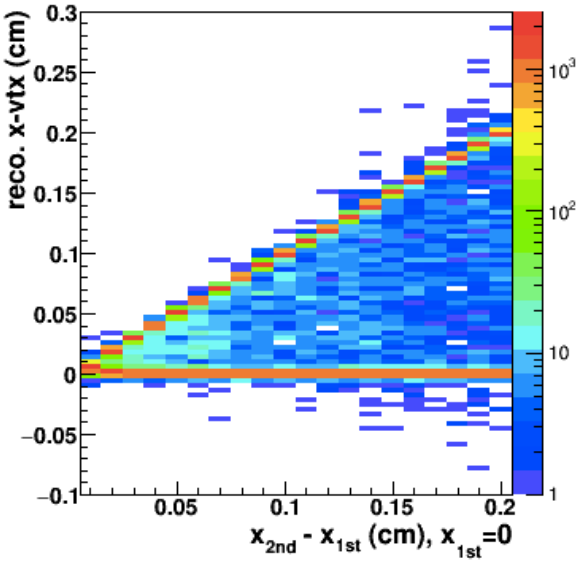
MIE **PIXEL+STRIP** **ITS**



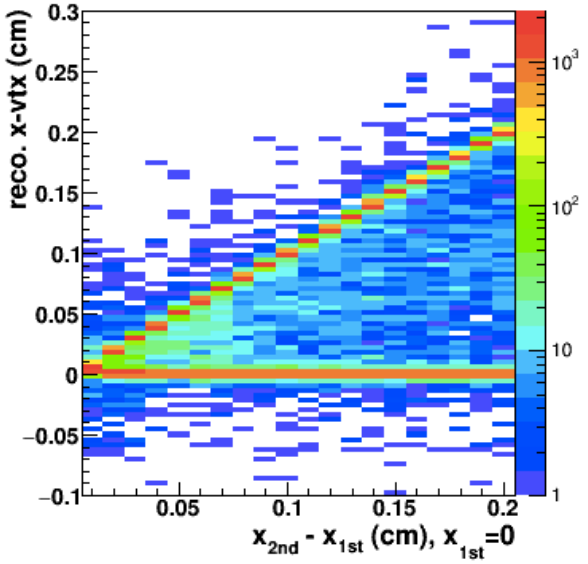
Multiple vertex reconstruction

- generate **5 tracks** at each x position of x=0 and x=x_{2nd} cm
- scan x_{2nd} from 0.01 cm to 0.20 cm with 0.01 cm interval (2k try for each x_{2nd})

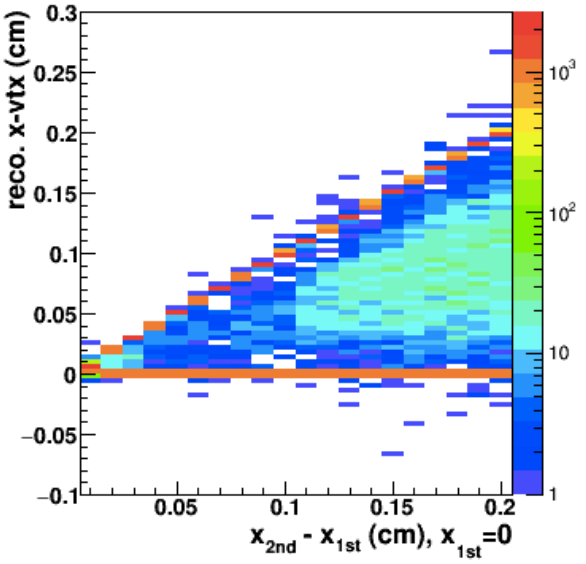
MIE



PIXEL+STRIP



ITS



Outlook

- Implementation
  - Connection to GenFit (help from Haiwang)
  - Handling B-field
    - looks working with reversed field
      (but failed with a negative field in PHG4HoughTransform)
  - Looking at detailed tunes (parameters/thresholds)

- Performance test
  - Vertex (Multiple vertices) reconstruction with PYTHIA events
  - Handling outlying tracks
  - Secondary vertex reconstruction (B-tagging efficiency & fake rates)